

31. A composition for transfecting a cell which comprises a nucleic acid and one or more compounds of claim 11. ⁶⁵

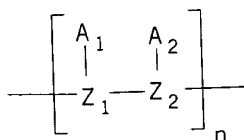
32. A lipid aggregate which comprises one or more compounds of claim 11. ⁶⁵

33. A method for transfecting a cell comprising the step of contacting the cell with a composition of claim 31.

34. A transfection kit which comprises one or more compounds of claim 11. ⁶⁵

35. The transfection kit of claim 34 further comprising a viral agent, a component of an enveloped virus, or a non-viral fusagenic peptide.

36. A lipophilic polyamino acid having the formula:



and salts thereof,

where:

Z_1 and Z_2 , independently of one another, are both amino acids selected from the group consisting of ornithine, lysine, arginine and histidine;

n is an integer ranging from 1 to about 2,000;

A_1 and A_2 , independently of one another, are selected from the group consisting of the groups $X_1 - X_6$ as follows:

- ~~X₁ is a straight-chain alkyl, alkenyl, or alkynyl group having from 2 to about 22 carbon atoms wherein one or more non-neighboring -CH₂- groups can be replaced with an O or S atom;~~
- ~~X₂ is a branched alkyl, alkenyl, or alkynyl group having from 2 to about 22 carbon atoms wherein one or more non-neighboring -CH₂- groups can be replaced with an O or S atom;~~
- ~~X₃ is a straight-chain or branched alkyl group substituted with one or two OH, SH, NH₂ or amine groups within about 3 carbon atoms of the bond between X₃ and Z;~~
- ~~X₄ is a substituted straight-chain or branched alkyl, alkenyl or alkynyl group having from 2 to about 22 carbon atoms wherein the substituent is an aromatic, alicyclic, heterocyclic or polycyclic ring and wherein one or more of the non-neighboring -CH₂- groups of said alkyl, alkenyl or alkynyl group can be substituted with an O or S atom;~~
- ~~X₅ is a -B-L group wherein B is selected from the group -CO-, -CO₂-, -OCO-, -CO-N-, -O-CO-N-, -O-CH₂-, -CH₂-O-, -S-CH₂-, -CH₂-S- or -CH₂- and L is selected from the group consisting of~~
- ~~X₁, X₂, X₄, or an aromatic, alicyclic, heterocyclic or polycyclic ring moiety; and~~
- ~~X₆ is a -CH(D-L)₂ or a -C(D-L)₃ group wherein D is selected from the group consisting of -CO-, -CO₂-, -OCO-, -CO-N-, -O-CO-N-, -O-, or -S- and L is selected from the group consisting of:~~

A3

~~X₁, X₂, X₄, or an aromatic, alicyclic, heterocyclic or polycyclic ring moiety.~~

37. The lipophilic polyamino acid of claim 36 wherein n is between 10 and 50.
38. The lipophilic polyamino acid of claim 36 wherein Z₁ and Z₂ are lysines.
39. The lipophilic polyamino acid of claim 36 wherein Z₁ and Z₂ are arginines.
40. The lipophilic polyamino acid of claim 36 wherein A₁ and A₂, independently of one another, are a straight-chain or branched alkyl, alkenyl, or alkynyl group having from 2 to about 22 carbon atoms wherein one or more non-neighboring -CH₂- groups can be replaced with an O or S atom.
41. The lipophilic polyamino acid of claim 40 wherein alkyl, alkenyl, or alkynyl groups have from about 12 to about 22 carbon atoms.
42. The lipophilic polyamino acid of claim 36 wherein the A₁ and A₂ groups are alkyl groups having from about 12 to 22 carbon atoms.
43. The lipophilic polyamino acid of claim 36 wherein A₁ and A₂, independently of one another, are straight-chain or branched alkyl groups substituted with one or two OH, SH, NH₂, or amine groups within about 3 carbon atoms of the bond between X₃ and Z.
44. The lipophilic polyamino acid of claim 36 wherein A₁ and A₂, independently of one another, are substituted straight-chain or branched alkyl, alkenyl or alkynyl groups having from 2 to about 22 carbon atoms wherein the substituent is an aromatic alicyclic, heterocyclic or polycyclic ring and wherein one or more of the non-neighboring -CH₂- groups of said alkyl, alkenyl or alkynyl group can be substituted with an O or S atom.

45. The lipophilic polyamino acid of claim 36 wherein A_1 and A_2 , independently of one another, are selected from the group consisting of:

a -B-L group wherein B is selected from the group -CO-, -CO₂-, -OCO-, -CO-N-, -O-CO-N-, -O-CH₂-, -CH₂-O-, -S-CH₂-, -CH₂-S- or -CH₂-; and

a -CH(D-L)₂ or a -C(D-L)₃ group wherein D is selected from the group consisting of -CO-, -CO₂-, -OCO-, -CO-N-, -O-CO-N-, -O-, or -S-.

wherein L is selected from the group consisting of: X_1 , X_2 , X_4 or an aromatic alicyclic, heterocyclic or polycyclic ring moiety.

46. A composition for transfecting cells which comprises a nucleic acid and a lipophilic polyamino acid of claim 36.

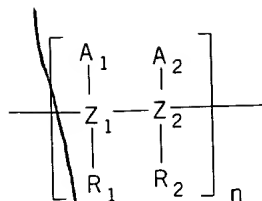
47. The composition of claim 46 wherein the lipophilic polyamino acid, the A_1 and A_2 groups are alkyl groups having from about 12 to about 22 carbon atoms.

48. A lipid aggregate comprising a lipophilic polyamino acid of claim 36.

49. A method for transfecting a cell which comprises the step of contacting the composition of claim 46 with a cell.

50. A transfection kit which comprises one or more lipophilic polyamino acids of claim 36.

51. A lipophilic polycationic polysaccharides of formula:



and salts thereof,

where Z_1 and Z_2 , independently of one another, are monosaccharides;

n is an integer ranging in value from 1 to about 600;

R_1 and R_2 , independently of one another, are tertiary amines; and

A_1 and A_2 , independently of one another, are selected from the group consisting of groups $X_1 - X_6$ as follows:

X_1 is a straight-chain alkyl, alkenyl, or alkynyl group having from 2 to about 22 carbon atoms wherein one or more non-neighboring $-CH_2-$ groups can be replaced with an O or S atom;

X_2 is a branched alkyl, alkenyl, or alkynyl group having from 2 to about 22 carbon atoms wherein one or more non-neighboring $-CH_2-$ groups can be replaced with an O or S atom;

X_3 is a straight-chain or branched alkyl group substituted with one or two OH, SH, NH_2 or amine groups within about 3 carbon atoms of the bond between X_3 and Z;

A3

X_4 is a substituted straight-chain or branched alkyl, alkenyl or alkynyl group having from 2 to about 22 carbon atoms wherein the substituent is an aromatic, alicyclic, heterocyclic or polycyclic ring and wherein one or more of the non-neighboring $-CH_2-$ groups of said alkyl, alkenyl or alkynyl group can be substituted with an O or S atom;

X_5 is a $-B-L$ group wherein B is selected from the group $-CO-$, $-CO_2-$, $-OCO-$, $-CO-N-$, $-O-CO-N-$, $-O-CH_2-$, $-CH_2-O-$, $-S-CH_2-$, $-CH_2-S-$ or $-CH_2-$ and L is selected from the group consisting of

X_1 , X_2 , X_4 , or an aromatic, alicyclic, heterocyclic or polycyclic ring moiety; and

X_6 is a $-CH(D-L)_2$ or a $-C(D-L)_3$ group wherein D is selected from the group consisting of $-CO-$, $-CO_2-$, $-OCO-$, $-CO-N-$, $-O-CO-N-$, $-O-$, or $-S-$ and L is selected from the group consisting of:

X_1 , X_2 , X_4 , or an aromatic, alicyclic, heterocyclic or polycyclic ring moiety.

52. The polycationic polysaccharide of claim 51 wherein Z_1 and Z_2 are both glucose.
53. The polycationic polysaccharide of claim 51 where n is between 50 and 100.
54. The polycationic polysaccharide of claim 51 wherein R_1 and R_2 are diethylaminoethyl groups.
55. The polycationic polysaccharide of claim 51 wherein A_1 and A_2 , independently of one another, are a straight-chain or branched alkyl, alkenyl, or alkynyl group having from 2 to

about 22 carbon atoms wherein one or more non-neighboring $\text{-CH}_2\text{-}$ groups can be replaced with an O or S atom.

56. The polycationic polysaccharide of claim 55 wherein alkyl, alkenyl, or alkynyl groups have from about 12 to about 22 carbon atoms.
57. The polycationic polysaccharide of claim 51 wherein A_1 and A_2 , independently of one another, are straight-chain or branched alkyl groups substituted with one or two OH, SH, NH_2 or amine groups within about 3 carbon atoms of the bond between X_3 and Z.
58. The polycationic polysaccharide of claim 51 wherein A_1 and A_2 , independently of one another, are substituted straight-chain or branched alkyl, alkenyl or alkynyl groups having from 2 to about 22 carbon atoms wherein the substituent is an aromatic, alicyclic, heterocyclic or polycyclic ring and wherein one or more of the non-neighboring $\text{-CH}_2\text{-}$ groups of said alkyl, alkenyl or alkynyl group can be substituted with an O or S atom.
59. The polycationic polysaccharide of claim 51 wherein A_1 and A_2 , independently of one another, are selected from the group consisting of:

a -B-L group wherein B is selected from the group -CO- , $\text{-CO}_2\text{-}$, -OCO- , -CO-N- , -O-CO-N- , $\text{-O-CH}_2\text{-}$, $\text{-CH}_2\text{-O-}$, $\text{-S-CH}_2\text{-}$, $\text{-CH}_2\text{-S-}$ or $\text{-CH}_2\text{-}$; and

a -CH(D-L)_2 or a -C(D-L)_3 group wherein D is selected from the group consisting of -CO- , $\text{-CO}_2\text{-}$, -OCO- , -CO-N- , -O-CO-N- , -O- , or -S- .

wherein L is selected from the group consisting of: X_1 , X_2 , X_4 or an aromatic alicyclic, heterocyclic or polycyclic ring moiety.

60. A composition for transfecting cells which comprises a nucleic acid and a polycationic polysaccharide of claim 51.